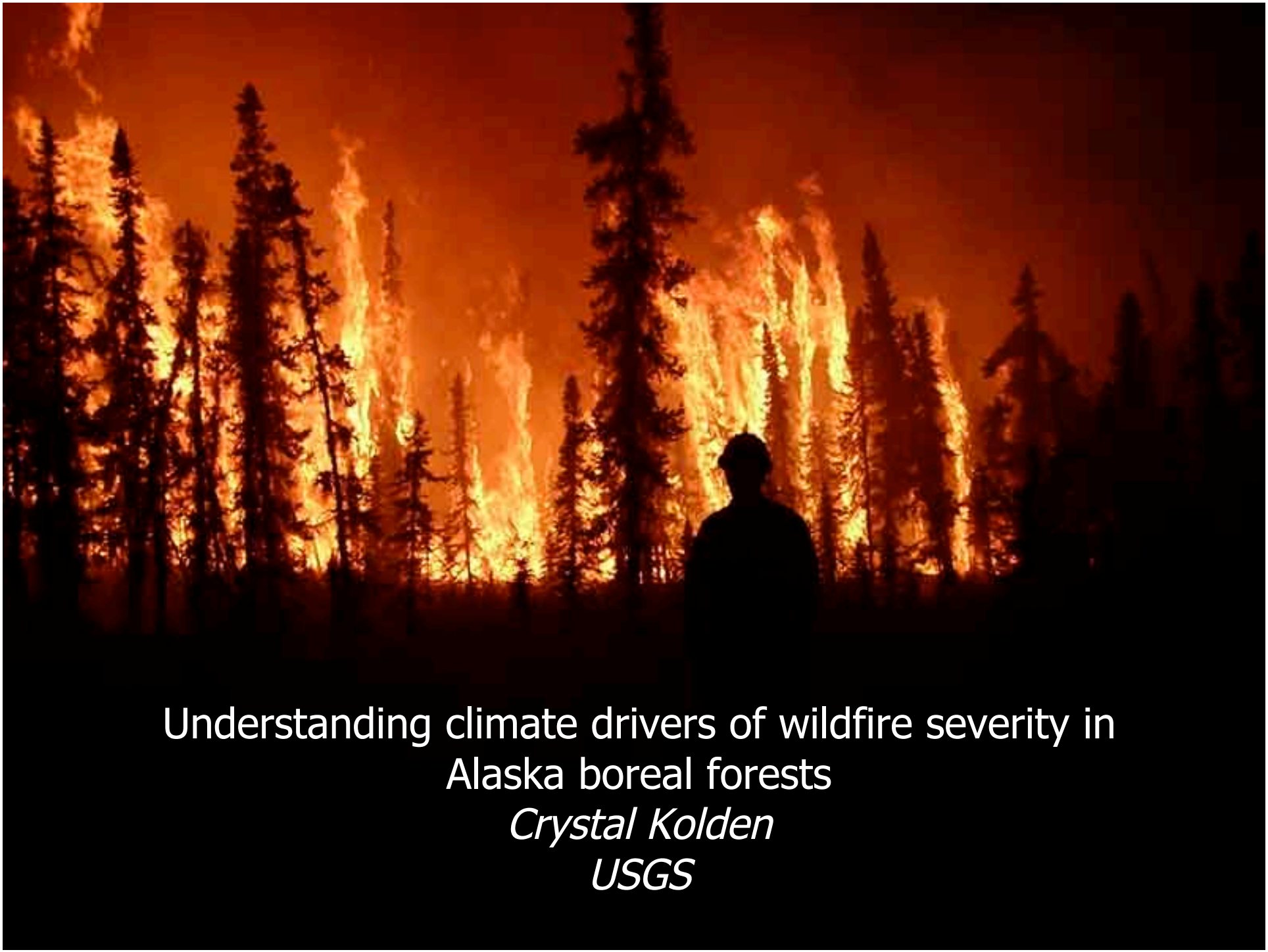
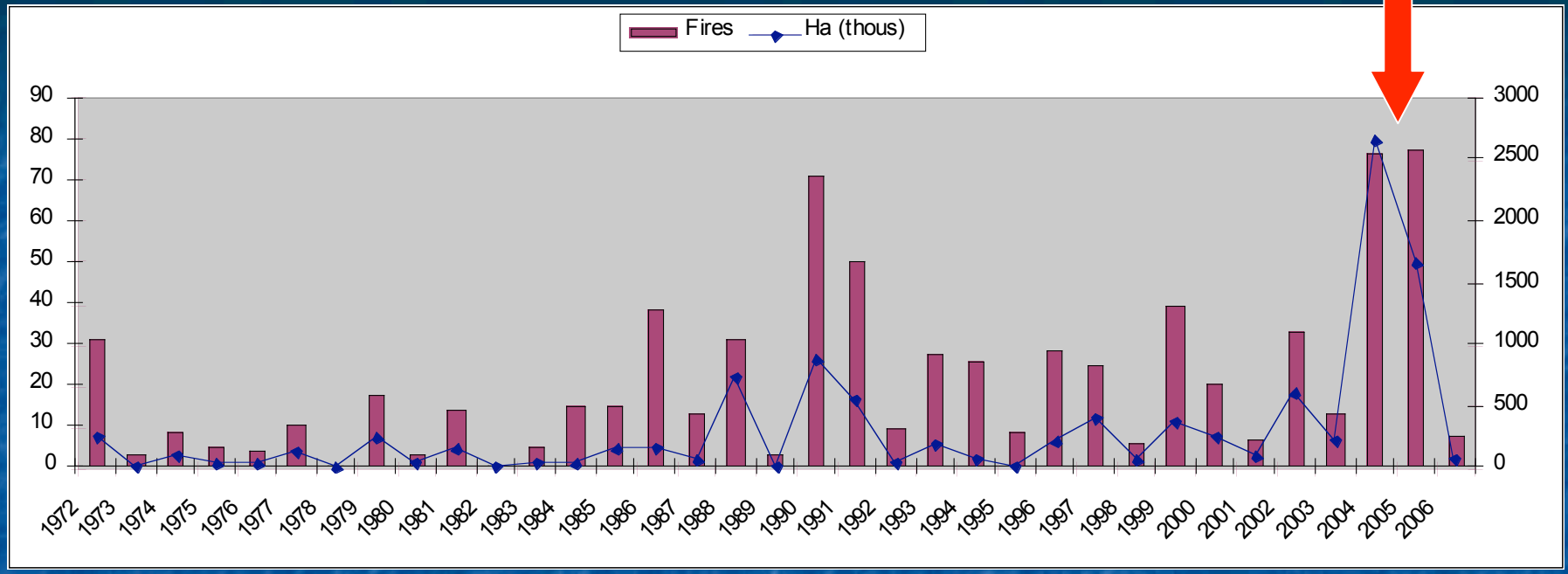


Understanding climate drivers of wildfire severity in Alaska boreal forests

Crystal Kolden
USGS

Fire in Alaska



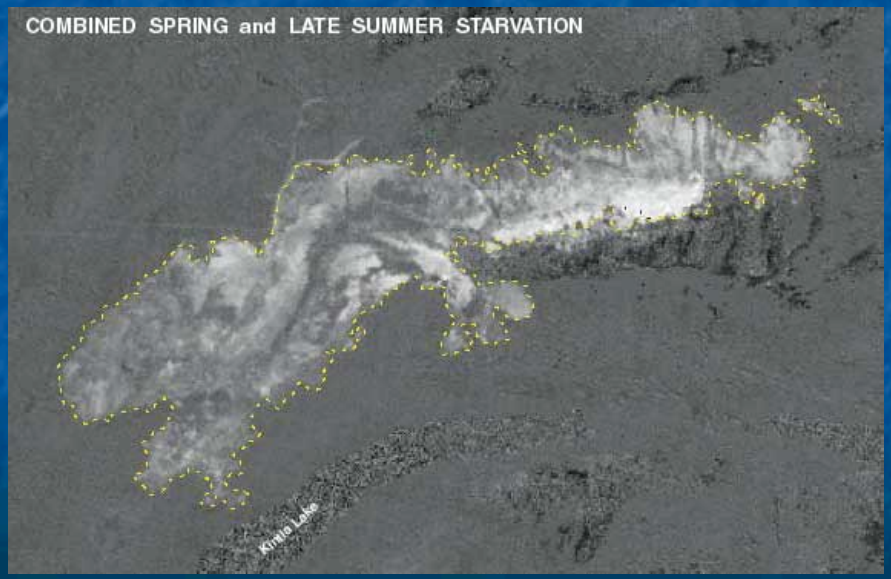
Hypothesis: Warming trends lead to increasing proportion and intensity of higher severity fire

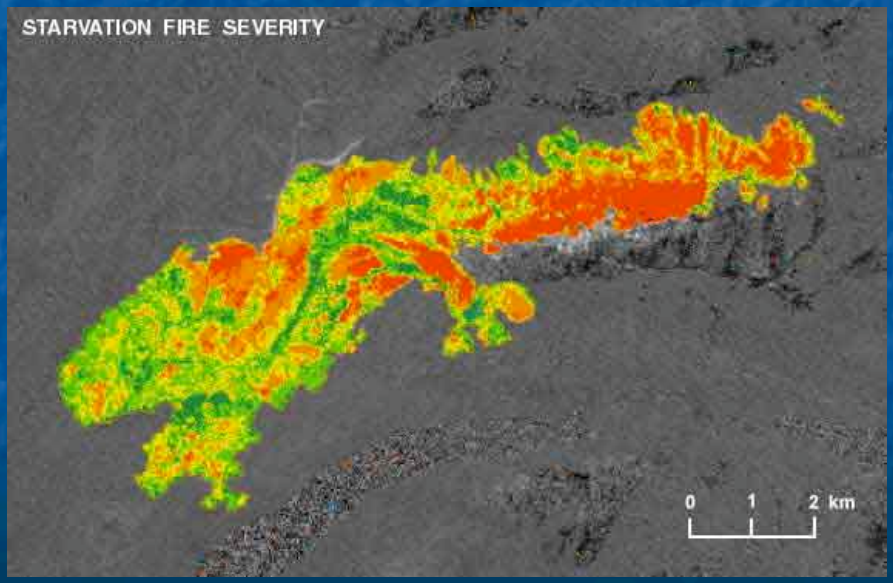
Objectives

1. Determine range of variability of burn severity in Alaska boreal forests (1972-2007)
2. Examine relationship between post-fire burn severity and interannual variability of precipitation and temperature
3. Determine if long-term temperature trends are drivers of changing burn severity

Measuring burn severity

- Monitoring Trends in Burn Severity
- Differenced Normalized burn severity (dNBR index)
- Landsat TM/ETM+ data (1982-2007)





Measuring burn severity in Alaska boreal forest

- Does the TM 4/7 ratio index capture soil consumption intensity and depth?
- What impacts do changing light conditions and limited Landsat availability have on dNBR data set creation?

Study Methods

- Use MSS to extend MTBS historical atlas
  - MSS from 1972- 1981 has 79 m resolution
  - Scan line problem and poor data limits analysis
  - Target: 10 fires from 1972-1982
  - Classification and regression tree (CART) techniques to delineate burn severity
- Landsat TM/MSS Crosswalk
  - 3-5 fires from 1980s: dNBR and CART methods, any plots?
- Validation of MTBS using available NPS, FWS, etc. CBI plots
  - Where does MTBS work? Where doesn't it work?
  - Can we achieve significantly higher degree of accuracy with spectral unmixing, CART and more advanced methods where necessary?
  - What specifically do we lose with dNBR?

Burn severity and climate

- MANOVA used to determine burn severity relationships to precipitation, temperature departures from average
- Classification trees will also inform this question
- Data from NARR (32 km) and observations (interpolated) used to develop higher resolution, climate imprinted data (Desert Research Institute creating PRISM-like data for Alaska)
- CCA or other method to explore relationships between direct (precip/temp) and trend (standardized departure from average)
- Relationship to fire danger (CFFDRS) indices also calculated to give burn severity meaning to fire danger

Future Climate and Fire Management

- Survey to determine what thresholds will determine changing fire management tactics
  - Weather parameters
  - Air quality
  - Fire danger indices (CFFDRS)
- Climate projections of daily/monthly weather, CFFDRS indices developed by DRI/WRCC
- Where/when are thresholds met that could induce increased suppression efforts?
- How does this conflict with observed trends in burn severity? Policy implications?

Assumptions

- 25 or 35 years is enough to see trends, climate change
- Climate impacts are visible in data
- NBR is capturing actual burn severity
- No other "significant" changes influence burn severity (albedo feedbacks, veg change)
- No significant shift in fire management policy

Expected Results

- Increased proportion of higher burn severity over 35 years
- Severity linked to trends/departures more than interannual observations (stress during warmer winters, summers)
- Fire management thresholds met increasingly later in fire season, increased overall suppression efforts